

Operating  
and Service  
Information

# **DN800**

Configurable Active  
Crossover

## **DN800 Configurable Active Crossover**

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The Klark Teknik DN800 is a highly specified, active frequency divider designed for use in sound reinforcement, recording studio and installed sound systems. It may be configured as a four-input, two-way systems or as a two-input, three or four-way system, the compact, 1U format making it particularly suitable for use in systems where space is at a premium.

Interchangeable cards are used to set the filter frequency and slope characteristics, while each band has its own adjustable VCA limiter, the time constants being optimised for the frequency range covered by that band. The plug-in filter cards offer a choice of 12, 18 or 24 dB/octave filter slopes with a choice of Linkwitz-Riley, Butterworth or Bessel responses. In many applications, the Linkwitz-Riley response is the most suitable as it exhibits equal phase shift in adjacent frequency bands at the filter corner points. Optional equaliser cards may be fitted.

Optional software is available for those users who wish to calculate component values with a view to populating their own filter boards. This runs on a standard PC computer and unpopulated filter boards are available.

In two-channel applications, the low bands may be linked to provide a mono feed to sub-bass or bass systems while in the stereo, three-way mode, the unused fourth band can be used to provide a direct (unfiltered) feed.

In addition to level and limiter controls, each band is equipped with a phase reverse switch and a continuously variable phase control (180 degrees maximum) based around an advanced all-pass filter design. In combination, these controls allow up to 360 degrees phase shift to be set independently for each band. Full LED status indication is provided for all relevant parameters in each frequency band.

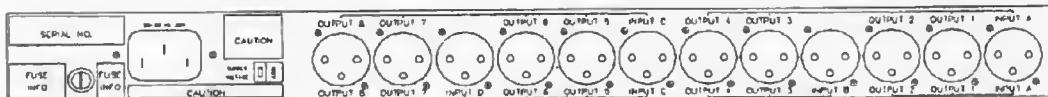
Provision is made for optional equaliser cards which can provide response 'tailoring' for each crossover band.

## **Connections**

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The signal connections are on conventionally wired XLRs (pin 2 hot). As standard, these are electronically balanced and operate at a nominal +4dBu signal level. Transformer balanced inputs are available as an option while internal System Gain trims can be used to reset the output level if required.

## Using the DN800 Configurable Active Crossover



### Controls

Before use, the internal links should be set to configure the system for dual, two-band stereo operation or three or four-band stereo operation. This is achieved by removing the top cover of the unit and selecting the appropriate link positions.

Note: If the DN800 was ordered to a specific setup requirement, then no internal re-adjustment should be required.

#### Level Control

All eight bands are fitted with Input Gain controls, the 0dB centre position indicating unity gain. These are located prior to the limiter circuitry in the signal chain and provide +/- 6dB of control enabling the user to make fine adjustments to the levels in each frequency band to suit the driver systems being used.

#### Mute switch

Latching mute switches are provided for each frequency band to assist in setting up and for checking the correct functioning of individual loudspeaker driver systems. A red status LED indicates that a band is muted.

#### Power

Mains power switch. This has no independent status LED as one of the 2-Way, 3-Way or 4-Way indicator LEDs will always be on when the unit is powered up. The remaining controls are located beneath the two security panels and will normally only require adjustment during the initial setup. The presets require a small screwdriver for adjustment while the latching switches may be set using a screwdriver, ballpoint pen or similar tool.

### **Limiter On**

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Depressing this switch puts the band limiter into circuit.

### **Limiter Threshold**

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Controls the limiter threshold over the range -12 to +12dBu. The limiter monitors the signal after the System Gain preset gain controls and so is not affected by any subsequent adjustments. The yellow Limit LED illuminates when the output signal reaches the limiter threshold and the red Over LED comes on when the signal exceeds the limiter threshold by more than 6dB.

### **Phase Reverse**

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Depressing this switch inverts the phase of the signal in the corresponding frequency band (180 degrees shift).

### **Phase Adjust**

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This preset provides a continuous adjustment of phase shift from 0 degrees (fully anticlockwise) to 180 degrees (fully clockwise). This may be used in combination with the Phase Reverse switch to provide precise phase adjustment up to 360 degrees. Bands 4 & 8 have no variable phase preset as it is normal to set up the lower bands with reference to the highest.

### **Mono Bass**

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Depressing this switch sums the signals in the low frequency bands (Bands 1 & 5) to mono. This is common practice when feeding bass or sub-bass speaker systems.

### **Sub Bass**

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The input stage incorporates a band pass filter operating at 30Hz to 30kHz. The low frequency response can be extended to 20Hz or 15Hz by replacing 3 filter capacitors on the main board:-

For input A change capacitors C45, C46, C47

For input C change capacitors C245, C246, C247

For a 30Hz filter (standard value) fit 330nF

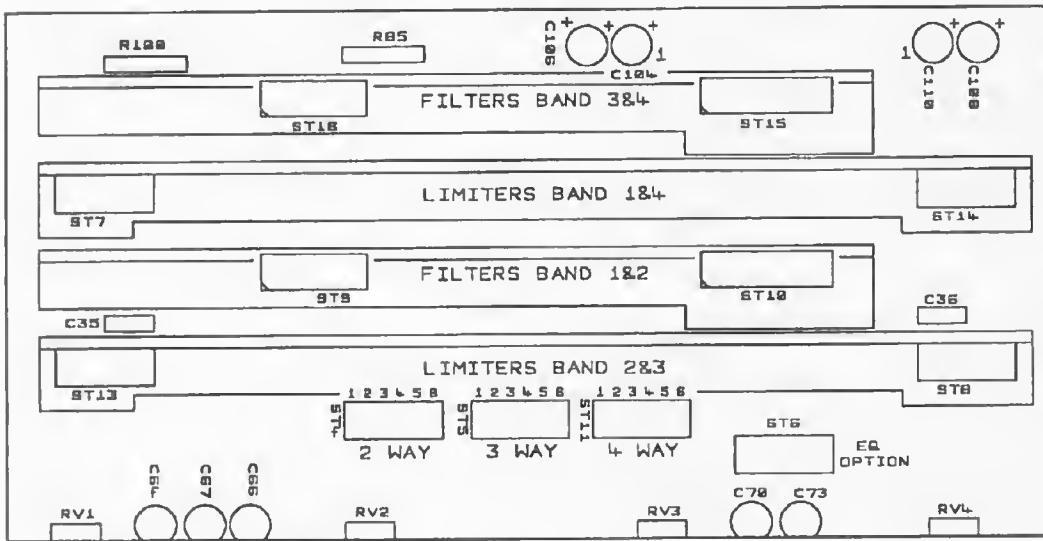
For a 20Hz filter fit 470nF

For a 15Hz filter fit 680nF

## Card Installation

Access to the unit is via the top cover which is retained by four captive fasteners. For the location of the individual cards, refer to diagram below.

### Filter and Limiter Card Location Diagram (Bands 1 - 4 shown only)



## System Gain

Adjustable make up gain is provided after the crossover filters to match the signal level to the power amplifier input requirements. These controls are accessed by removing the top cover and give a gain range from -6dB to +12dB.

## Operation

The Klark Teknik DN800 can be used to provide four channels of two-way operation or two channels of either three or four-way operation. In dual three-way operation, bands 4 and 8 may be used to provide a direct output, for example, to a secondary system which utilises passive crossovers.

Whatever the configuration chosen, all inputs pass through an independent band limiting filter section providing an 18dB/octave high pass response at 30Hz and an 18dB/octave low pass response at 30kHz. This provides an extra degree of driver protection and is effective in rejecting RF interference.

### Frequency card component table

Desired frequency	Capacitor	Resistor (ohm)
50Hz	330nF	6.8k
63Hz	220nF	8.2k
80Hz	330nF	4.3k
100Hz	100nF	11k
125Hz	100nF	9.1k
160Hz	47nF	15k
200Hz	100nF	5.6k
250Hz	22nF	20k
315Hz	33nF	11k
400Hz	68nF	4.3k
500Hz	33nF	6.8k
630Hz	22nF	8.2k
800Hz	33nF	4.3k
1000Hz	10nF	11k
1250Hz	10nF	9.1k
1600Hz	4.7nF	15k
2000Hz	10nF	5.6k
2500Hz	2.2nF	20k
3150Hz	3.3nF	11k
4000Hz	6.8nF	4.3k
5000Hz	3.3nF	6.8k
6300Hz	2.2nF	8.2k
8000Hz	3.3nF	4.3k
10000Hz	1nF	11k
12500Hz	1nF	9.1k
16000Hz	1nF	6.8k
20000Hz	1nF	5.6k

## Limiter and Phase Capacitor Selection Table

Frequency Hz	Limiter Capacitor	Phase Capacitor (Farads)
20	1uF	470nF
25	1uF	470nF
31.5	1uF	330nF
40	1uF	270nF
50	1uF	220nF
63	1uF	150nF
80	20mS	120nF
100	Attack	100nF
125		82nF
160		68nF
200		47nF
250		47nF
315		33nF
400		27nF
500	6.6mS	22nF
630	Attack	15nF
800		12nF
1k		10nF
1k25		8n2F
1k6	2mS	6n8F
2k	Attack	4n7F
2k5		4n7F
3k15		3n3F
4k		2n7F
5k	.66mS	2n2F
6k3	Attack	1n5F
8k		1n2F
10k		1nF
12k5	.2mS	820pF
16k	Attack	680pF
20k		470pF

## Limiter Setup

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If the limiters are to be used to eliminate the possibility of power amplifier clipping, they can be set up by monitoring the clip LEDs on the amplifiers and applying a high level test signal. It is advisable to run the amplifiers into a dummy load during this operation. The limiter threshold can then be backed off until the clip LEDs on the amplifier are just extinguished. A more accurate method is to monitor the amplifier output waveform with an oscilloscope which will enable the point of clipping to be determined with greater precision. It is recommended that the limiter be set at least 1dB below the clipping threshold of the power amplifier due to possible amplifier performance fluctuations during normal use.

If the limiter is required to limit the amplifier power to below its maximum output level, then the output of the amplifier must be measured at the desired power ceiling and the limiter threshold set accordingly.

## Limiter Time Constants

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The Attack and Release Time Constants for the limiters are determined by a capacitor fitted to the filter card. This is used to "optimise" the limiter protection for the frequency band selected. When using limiter protection there is always a compromise required between the degree of protection, the maximum sound pressure level and the amount of distortion when limiting occurs.

The following table gives some suggested capacitor values to provide reasonably low distortion while still offering a high degree of protection. The capacitor selection should be made for the lowest frequency in the crossover filter pass band. For example:

- 1) A mid frequency driver operating from 500Hz to 2K5Hz should select a limiter capacitor for 500Hz on the table i.e. 330nF.
- 2) A low frequency driver should select a limiter capacitor for 30Hz.

## Phase Adjustment

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Because of the mechanical characteristics of loudspeakers and the geometry of their cabinets, it is generally necessary to adjust the relative phases of the signals feeding drivers in adjacent bands in order to ensure that the sound from drivers is in phase in the crossover region.

Normally, the highest frequency band is used as a reference and all other bands set in relation to that. When the phase is optimised, the level of a test frequency equal to the frequency of the crossover region being optimised will be at a maximum. Hence if, for example, a crossover point is set to 2.5kHz, a 2.5kHz test signal may be applied and then the phase adjustment preset of the lower band turned until the signal is at a maximum. If this occurs at one or other extreme of the preset's travel, then the Phase Invert button should be operated.

A more reliable method is to adjust the phase preset to give a minimum signal level which will occur at the point when the signals in the adjacent bands are exactly 180 degrees out of phase. Once the minimum has been located, the Phase Invert button can be operated to bring the signals back into phase. Some engineers prefer to make final adjustments while listening to musical programme material over the system.

The correct sequence when setting up a four-way system is to first adjust the phase of the third band to align the phase at the crossover point between the third and fourth bands. The process is then repeated using the appropriate test frequency for the crossover point between the second and third bands. Finally, the lower crossover point can be optimised using the phase control preset on the lowest band. If any subsequent adjustment is made to any of the phase controls, then the bands below it should also be readjusted.

## Signal Path

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After being de-balanced at the input, the signal is passed through the fixed high and low pass filters (18dB/octave high pass response at 30Hz and 18dB/octave low pass response at 30kHz) before being routed to the filter bands via the 2-way or 3/4-way links.

The front panel Gain control is located at the start of the band signal path after which the signal is passed through the limiter and filter circuitry before encountering the System Gain output level trim control (internal). There is an additional control input to the limiter taken after the System Gain control so that any increase in level caused by resetting this control will not cause the limiting threshold to change. The filtered signal is then balanced and passed to the output via the muting relay. This relay also mutes the signal during power up to reduce the risk of loudspeaker damage.

## Configurations

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Four-channel, Two-way  
LEDs Indicate: 2 WAY

Input 1	Output 1 Low	Output 2 High.
Input 2	Output 3 Low	Output 4 High
Input 3	Output 5 Low	Output 6 High.
Input 4	Output 7 Low	Output 8 High.

Two-channel, Three-way  
LEDs Indicate: 3 WAY

Input 1	Output 1 Low	Output 2 Mid
	Output 3 High	Output 4 Direct
Input 2	Output 5 Low	Output 6 Mid
	Output 7 High	Output 8 Direct

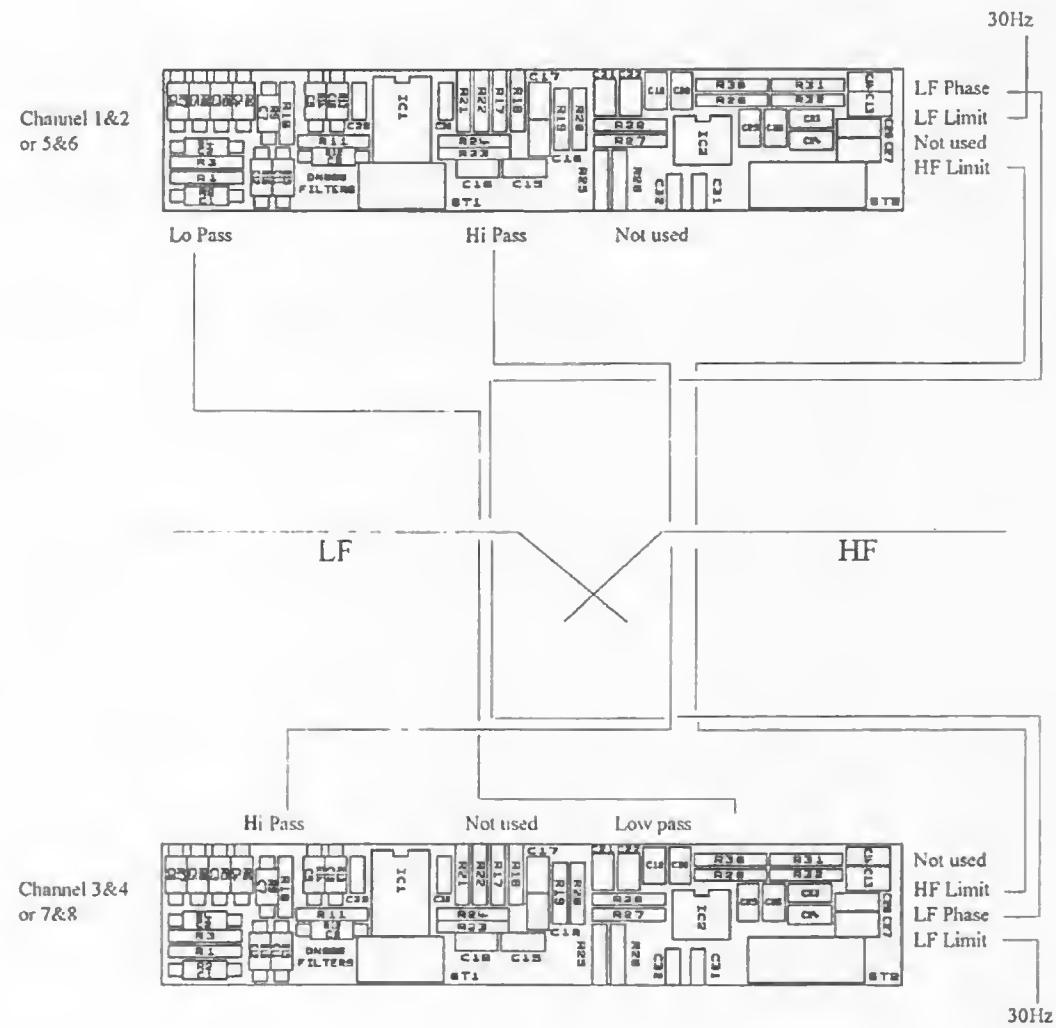
Two-channel, Four-way  
LEDs Indicate: 4 WAY

Input 1	Output 1 Low	Output 2 Low Mid
	Output 3 High Mid	Output 4 High.
Input 2	Output 5 Low	Output 6 Low Mid
	Output 6 High Mid	Output 8 High

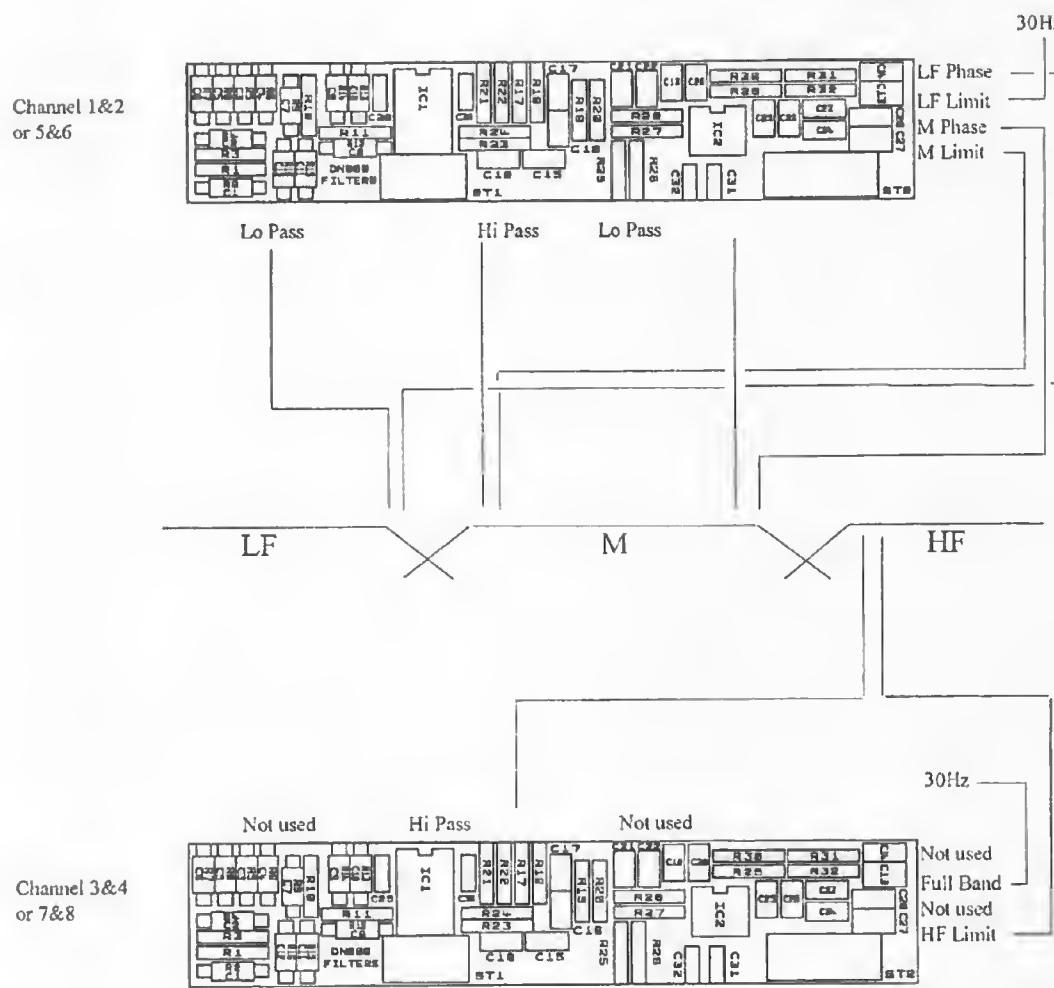
## Specifications

<b>Inputs</b>	<b>Four</b>
Type	Balanced (electronically)
Impedance	(ohm)
	Balanced 20k
	Unbalanced 10k
<b>Outputs</b>	<b>Eight</b>
Type	Balanced (electronically)
Min. load impedance	600ohm
Source impedance	<60ohm
Max. level	>+21dB
<b>Performance</b>	
Distortion	<0.01% (20Hz to 20kHz @ 4dB)
Equivalent input noise	<-90dBu (any output) (20Hz to 20kHz unweighted)
Nominal gain	0dB
Adjustable gain	+ or - 6db on front panel control additional +12 or -6dB on internal preset
Limiter threshold	-12dB to +12dB
Phase relationship	Continuously adjustable 0 degrees to 180 degrees between bands Polarity switch provides additional 180 degrees
<b>Frequency division filters</b>	Butterworth, Bessel or Linkwitz-Riley 12, 18 or 24dB/Oct
<b>Power requirements</b>	
Voltage	110/120/220/240v 50/60HzAC
Consumption	<30 vA
<b>Dimensions</b>	
Width	482mm (19 inches)
Height	44mm (1.75 inches)
Depth	285mm (11.2 inches)
<b>Weight</b>	
Net	3.5kg
Shipping	6kg

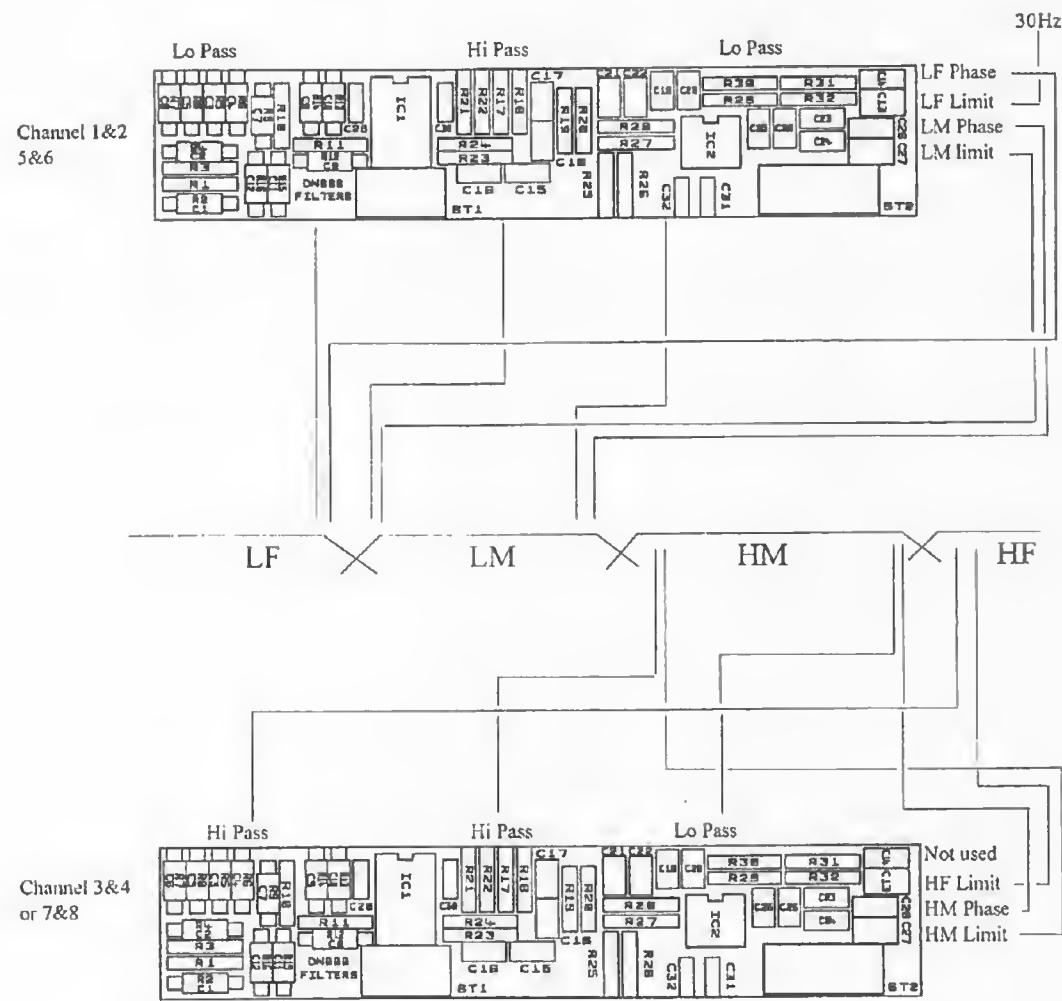
## 2-WAY CROSSOVER FILTERBOARD

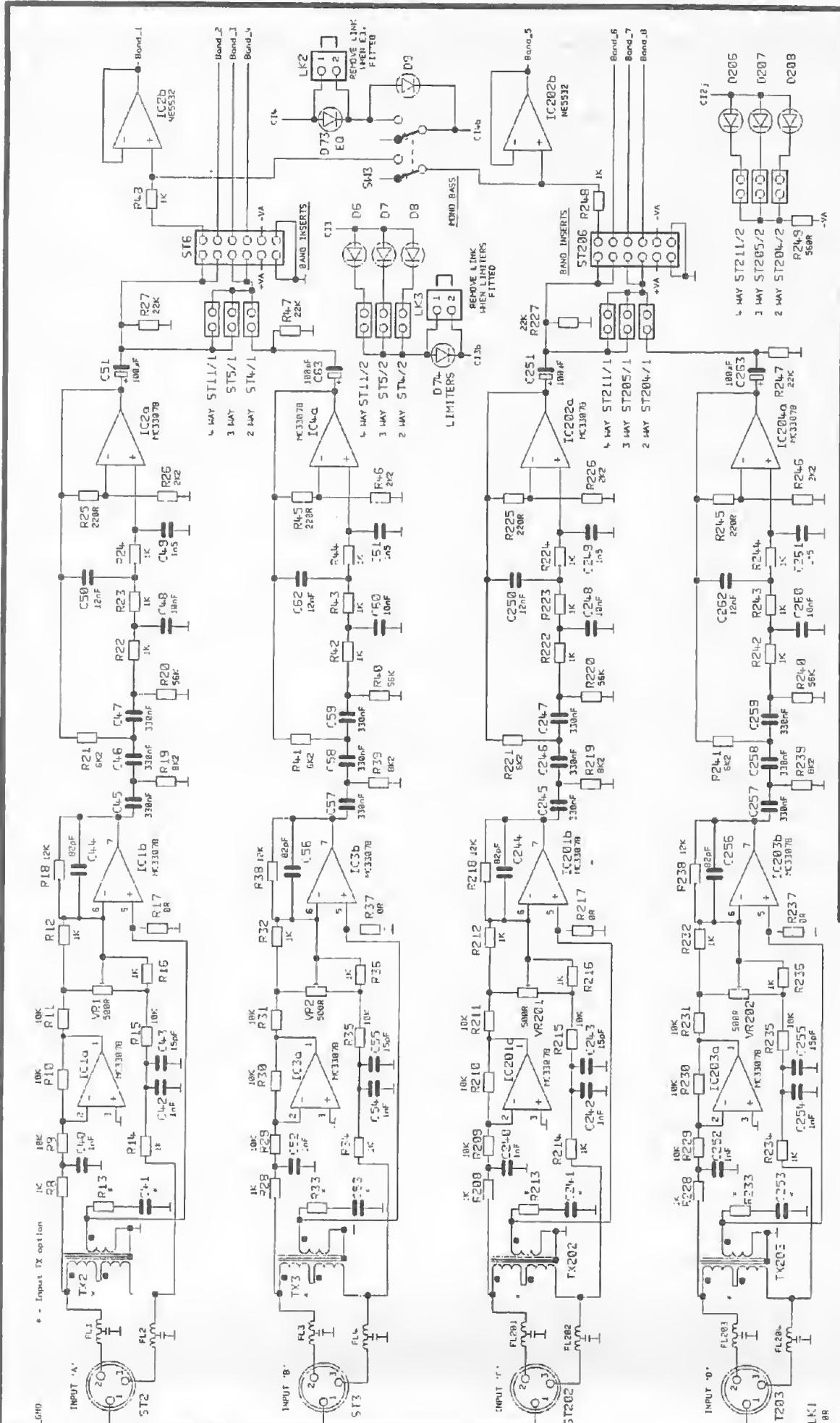


# 3-WAY CROSSOVER FILTERBOARD



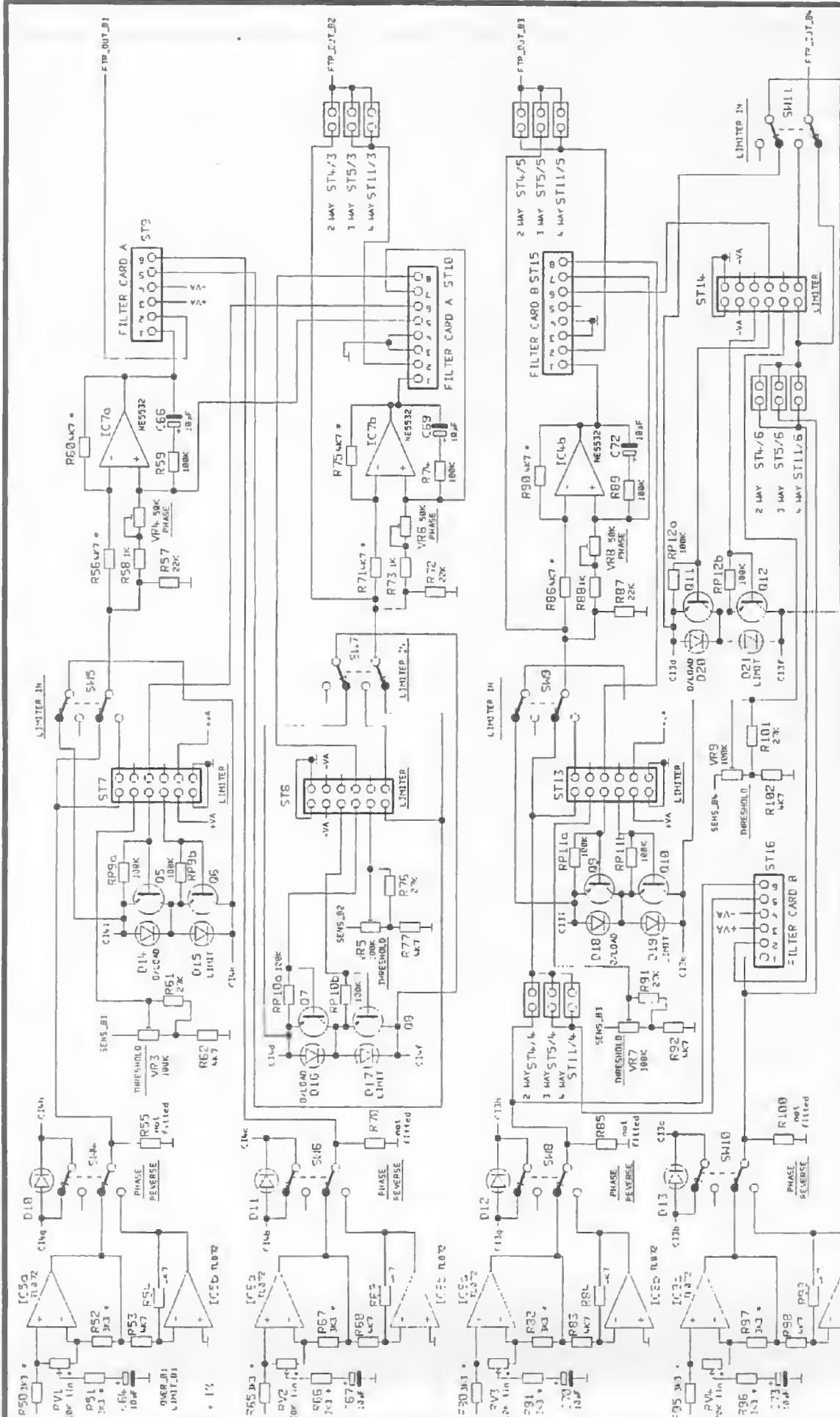
## 4-WAY CROSSOVER FILTERBOARD





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 BOARD No. B2749/50 Iss 1 DWG No. DN800\_1.DGM ISSUE: 2 DATE: 12.Oct.92

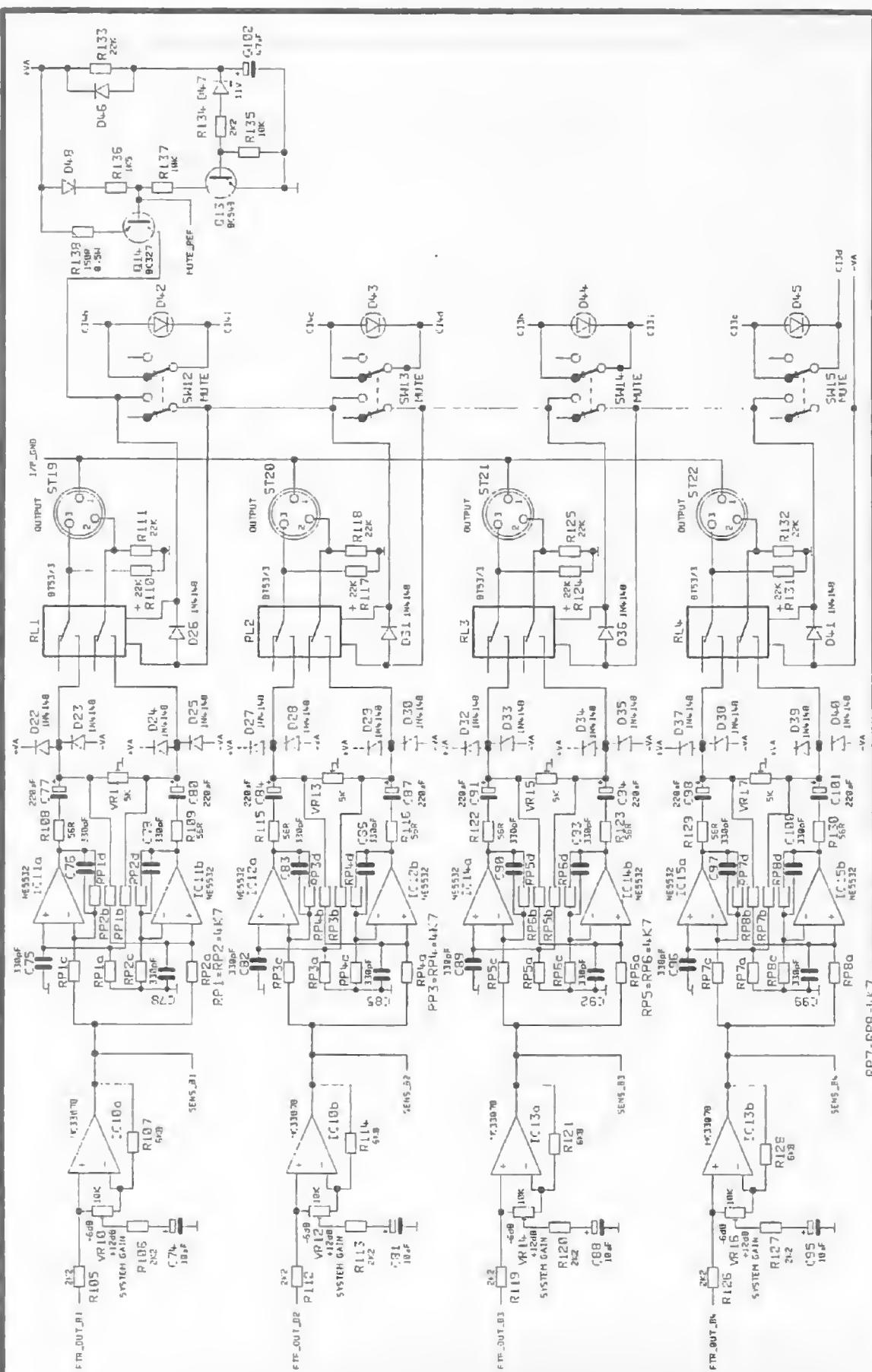


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DN800 CROSSOVER BAND 1-4 PHASE & INSERTS  
DWG No. DN800\_2.DGM ISSUE: 2 DATE : 12.Oct.92

Drawn : DGT Checked :  
BOARD No . B2749/50

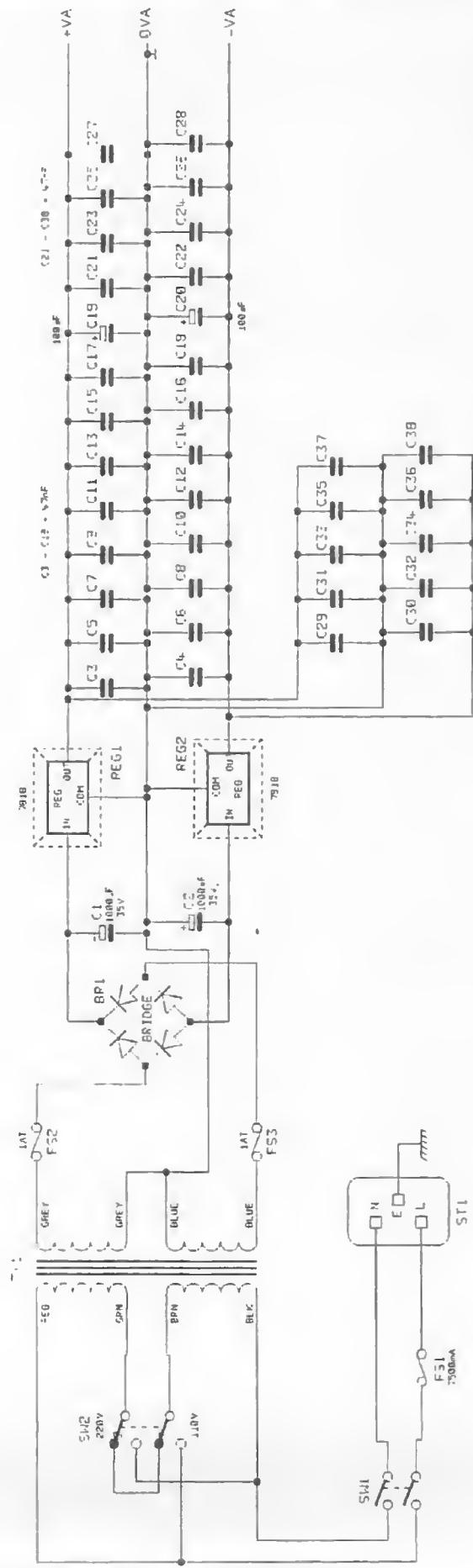
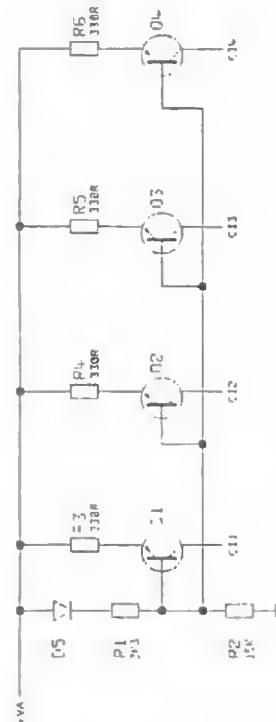


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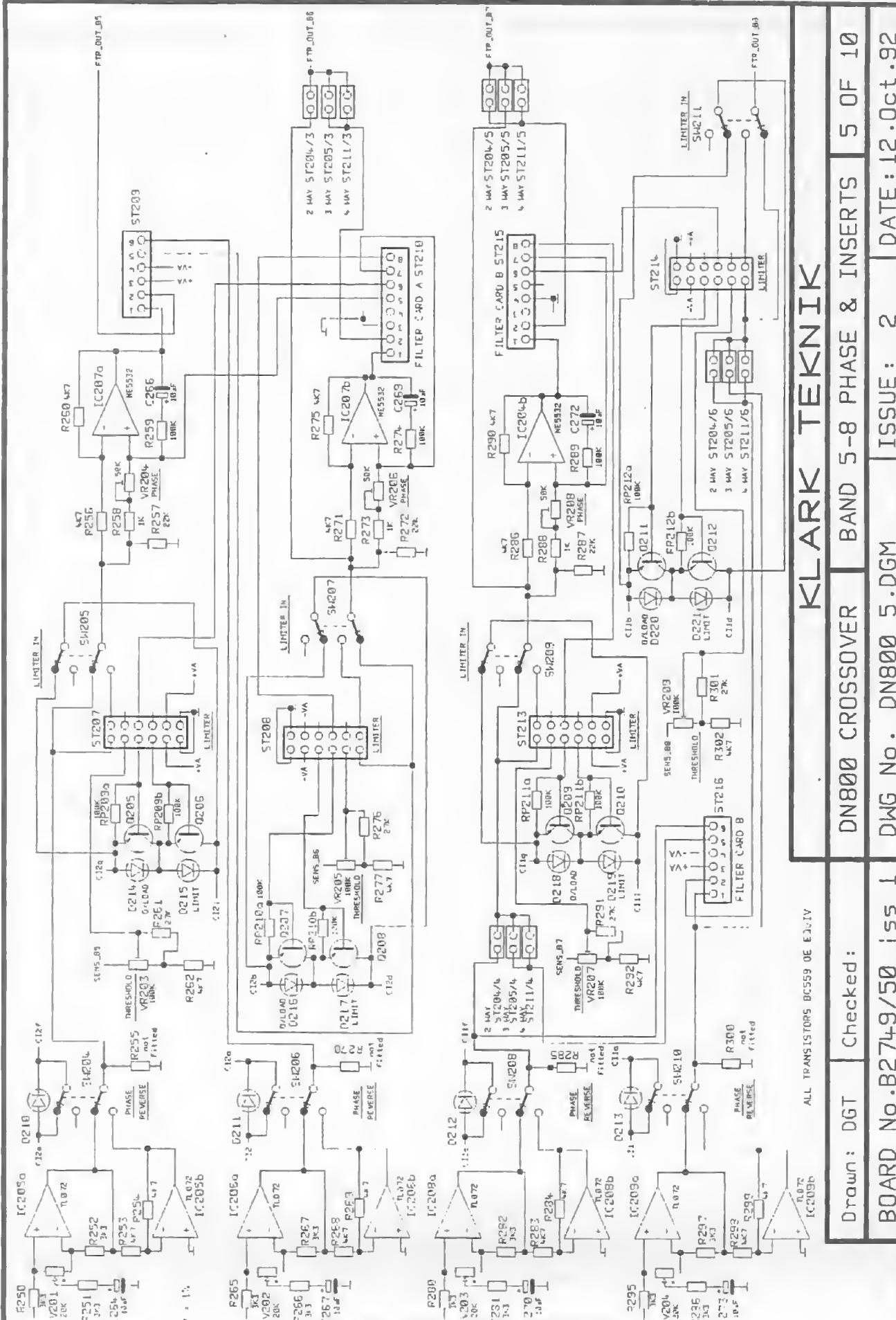
**DN800 CROSSOVER**      **BAND 1-4 GAIN, OUTPUT & MUTE**      **3 OF 10**

BOARD No. B2749/50      ISSUE: 2      DATE: 12.Oct.92

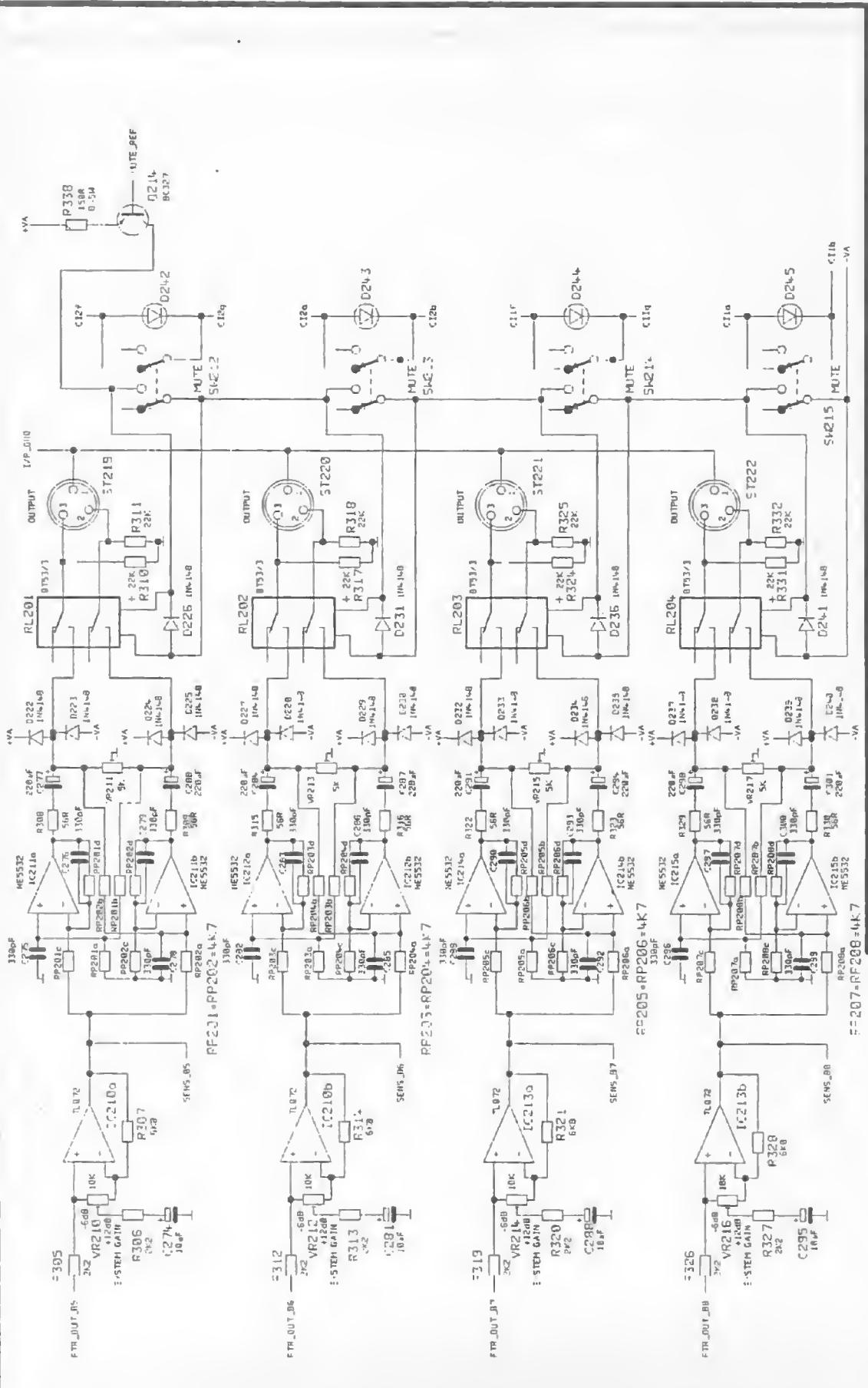


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BOARD No . B2749/50	ISSUE : 1	DWG No . DN800_4.DGM	ISSUE : 2	DATE : 12-Oct-92

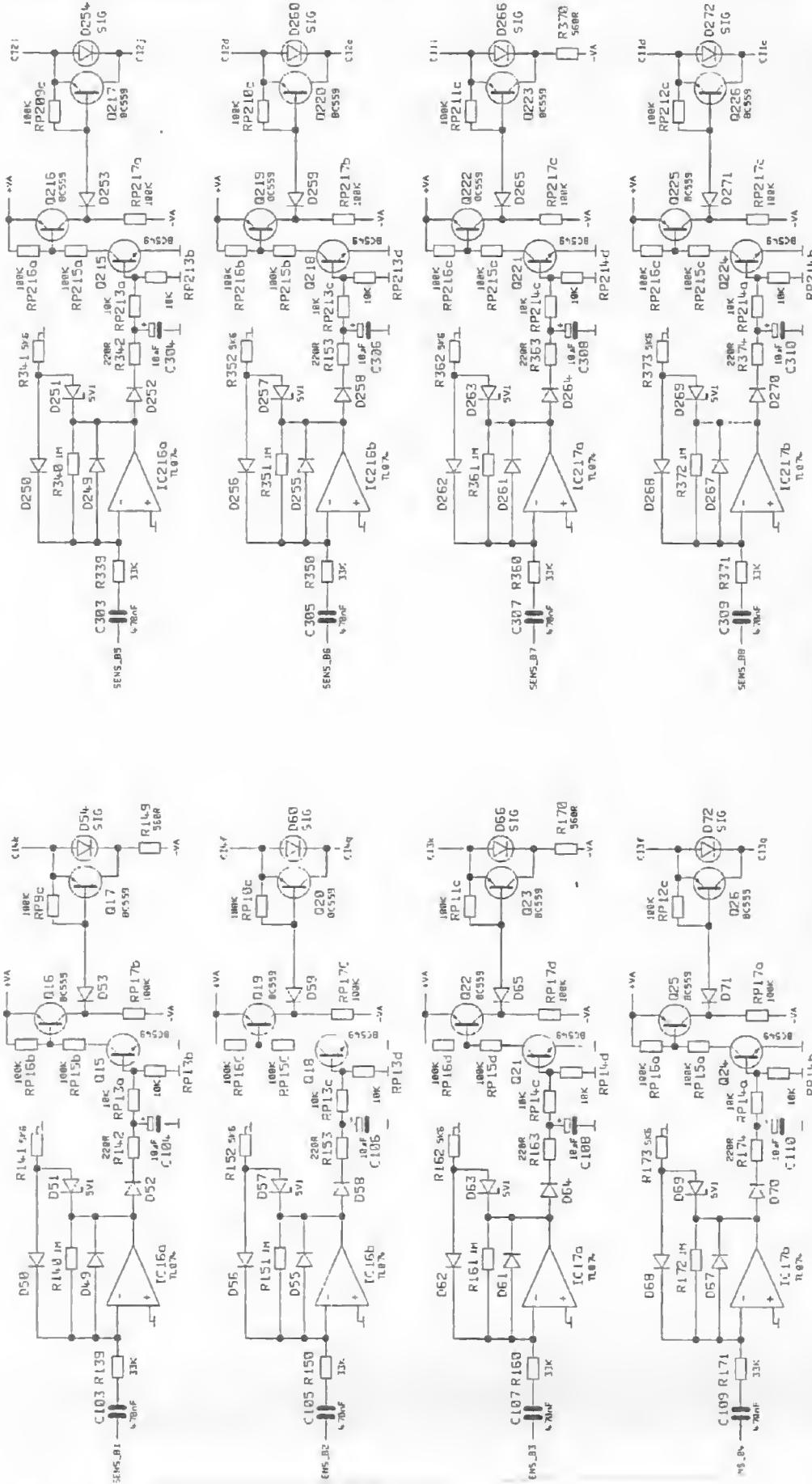


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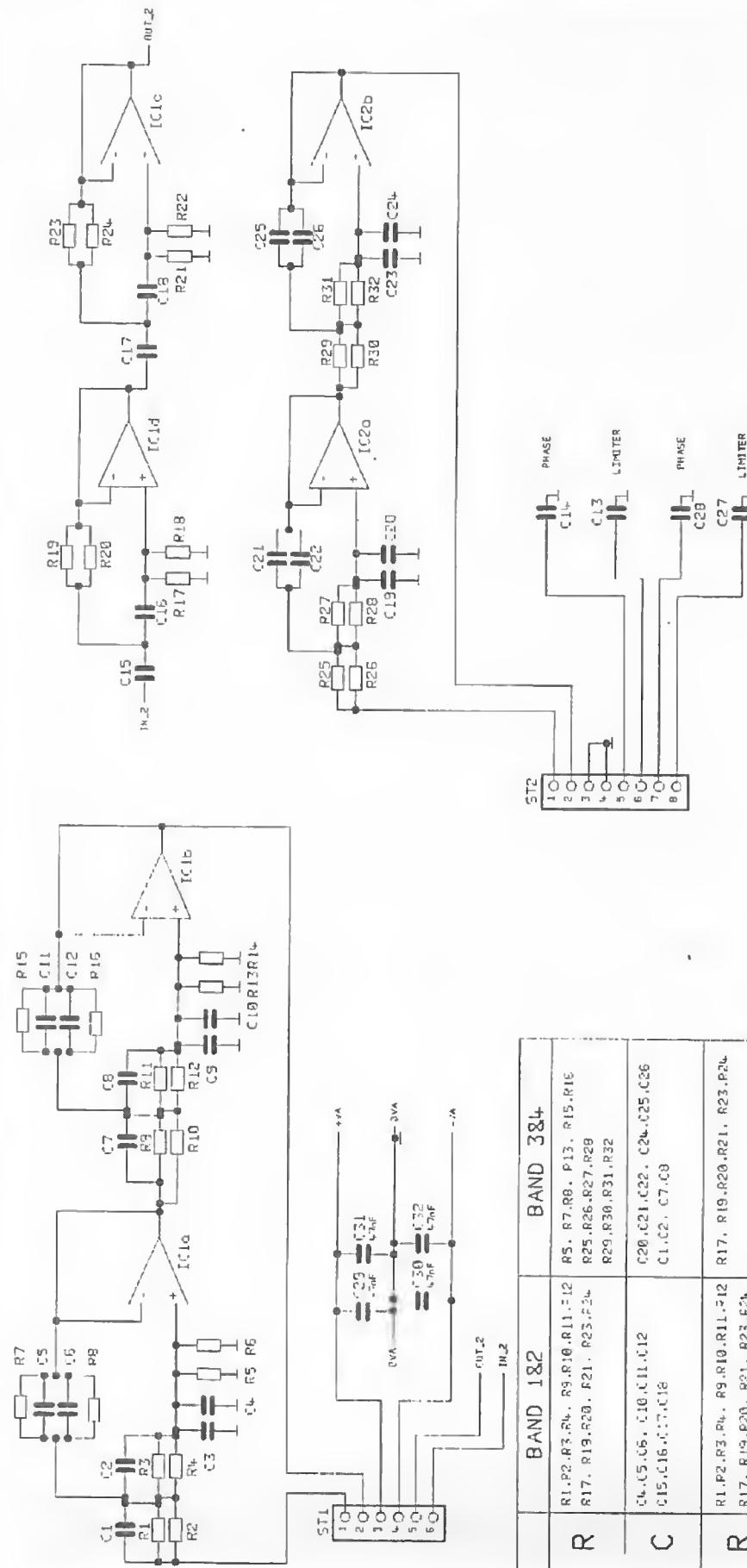
KLARK TEKNIK

Drawn: DGT	Checked:	DN800 CROSSOVER	BAND 5-8	GAIN.	OUTPUT & MUTE	6 OF 10
BOARD No. B2749/50	155 1	DWG No. DN800_6.DGM		ISSUE: 2	DATE: 12-Oct-92	



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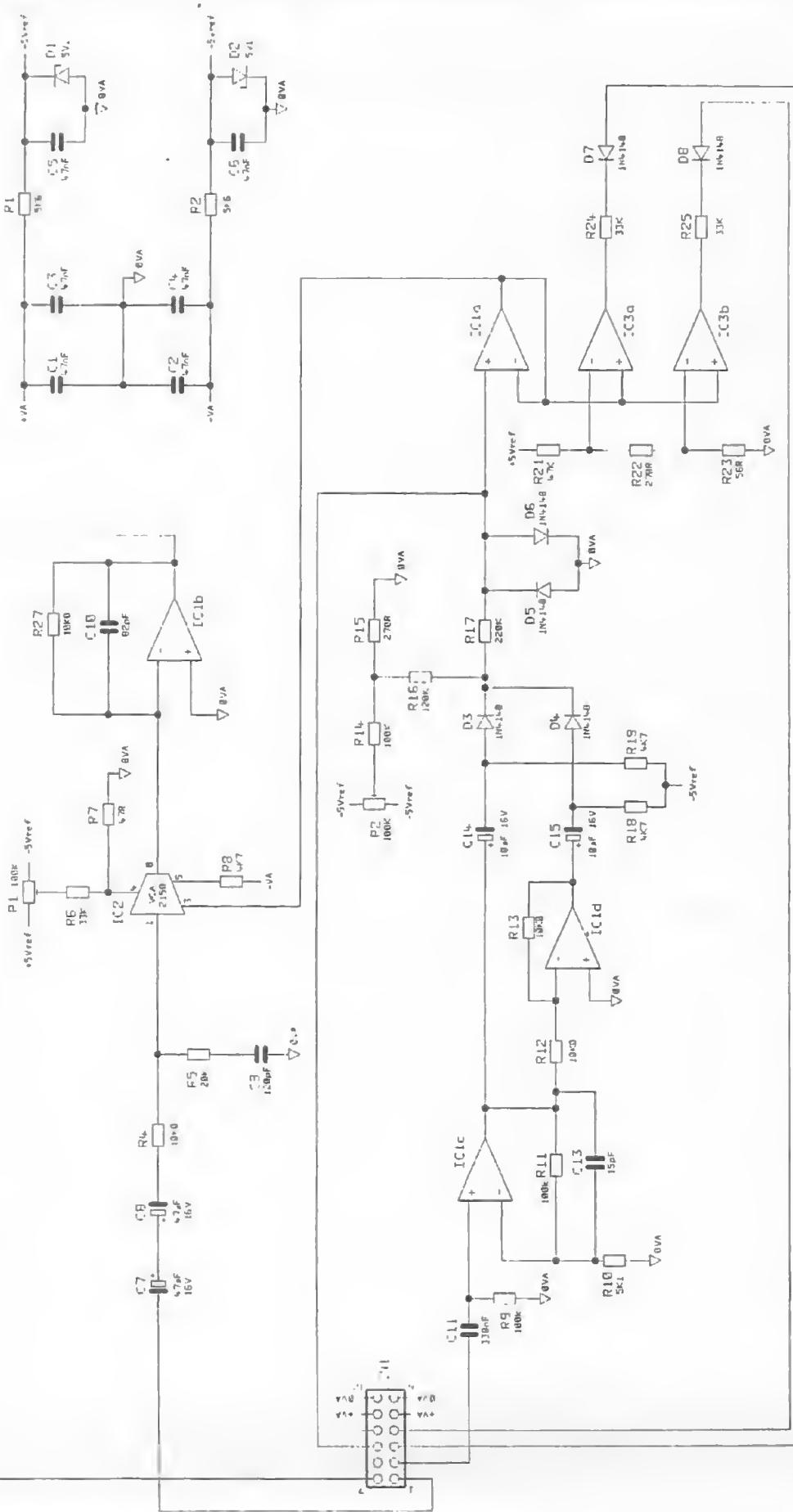
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BOARD No . B2749/50	ISSUE : 1	DWG No . DN800_7.DGM	ISSUE : 2	DATE : 12.Oct.92



	BAND 1&2	BAND 3&4
2	R R1.R2.R3.R4, R9.R10.R11.R12 R17, R19.R20, R21, R23.R24 C1, C2, C3, C4, C5, C6, C7, C8 C10, C11, C12, C13, C14, C15, C16, C17, C18	R5, R7.R8, R13, R15, R16 R25, R26, R27, R28 R29, R30, R31, R32 C26, C27, C28, C29, C30, C31, C32 C1, C2, C7, C8
3	R R1.R2.R3.R4, R9.R10.R11.R12 R17, R19.R20, R21, R23.R24 C15, C16, C17, C18	R17, R19.R20.R21, R23.R24 C15, C16, C17, C18
4	R R1.R2.R3.R4, R9.R10.R11.R12 R17, R19.R20, R21, R23.R24 C15, C16, C17, C18	R5, R7.R8, R13, R15, R16 R17, R19.R20, R21, R23.R24 C15, C16, C17, C18 C1, C2, C7, C8

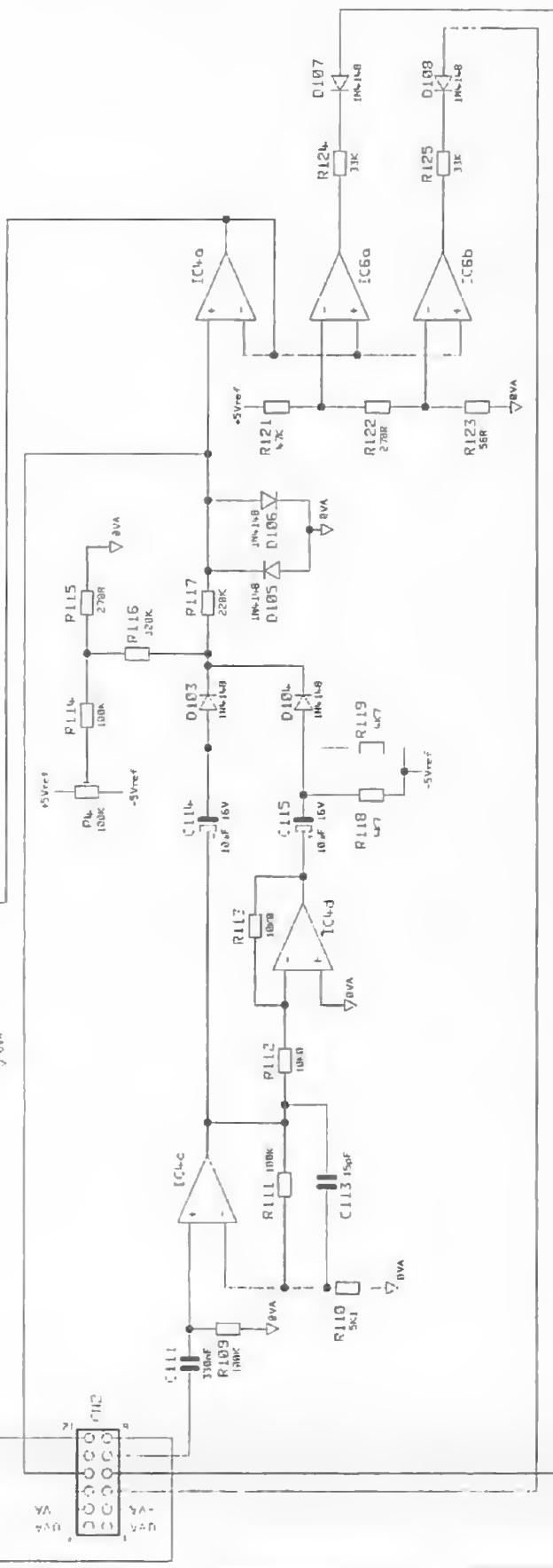
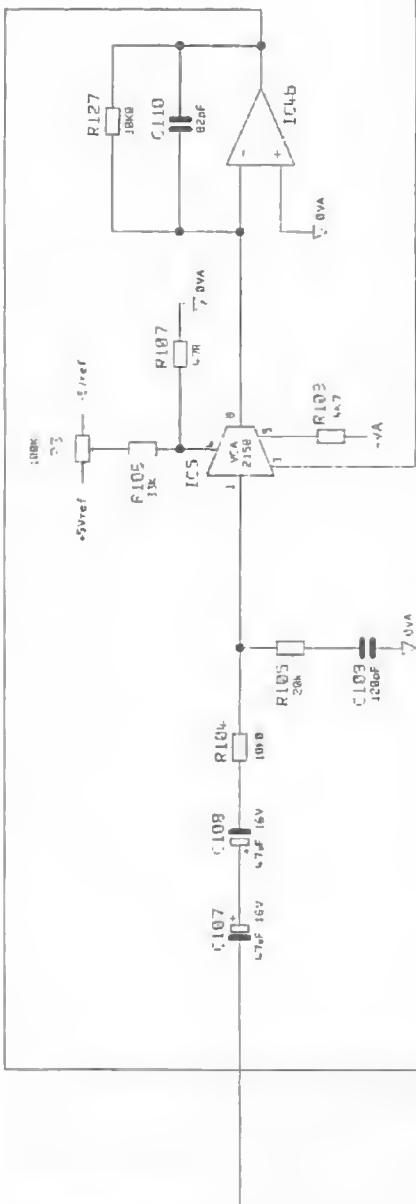
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BOARD No .B2749/50	Issue 1	DWG No . DN800_FL.DGM	ISSUE : 2	DATE : 12.Oct.92

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Drawn: T.K.G	Checked:	DN800 CROSSOVER	LIMITER A & POWER SUPPLY	9 OF 10	
BOARD No. B2747/2	DWG No. DN800_L1.DGM	ISSUE: 2	DATE: 12-Oct-92		



KLARK TEKNIK

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BOARD No .	B2747/2	DWG No . DN800_L2.DGM	ISSUE : 2	DATE : 12.Oct.92